METR 5403/4403: Applications of Meteorological Theory to Severe-Thunderstorm Forecasting – SPRING 2017

Primary Instructors:	Dr. Ariel Cohen (SPC), Rich Thompson (SPC), and Dr. Steven Cavallo (NWC 5349)
Class periods:	MW 4:00 PM-5:15 PM
Teaching Assistants:	Andrew Moore (NWC 5115)
Office Hours Location:	NWC 1313 and National Weather Center atrium after class
Office Hours:	MW 5:15 PM-7:00 PM, and by appointment
Classroom:	NWC 1313 unless otherwise specified
E-mail:	ariel.cohen AT noaa.gov and richard.thompson AT noaa.gov
Webpage:	`http://weather.ou.edu/~acohen`
Prerequisites:	Apply theoretical aspects of atmospheric sciences to severe-thunderstorm forecasting.
Required Text:	None. Assignments and self-study will involve referencing peer-reviewed journal articles and supplementary Internet materials.

Course goals and description: This is a 3-semester-hour course that instructs students on applications of meteorological theory to the forecasting of deep, moist convection and will be led by SPC forecasters Dr. Cohen and Mr. Thompson and overseen by Dr. Cavallo. This course provides an opportunity to bridge the academia and operational forecasting realms and provide an opportunity for students to learn from experienced meteorologist-forecasters who have performed research on a variety of topics. In turn, students will gain appreciation for challenges in operational meteorology and learn about forecasting methods and gaps in our understanding of meteorological applications of theory. This experience would also foster stronger relationships between the School of Meteorology and the Storm Prediction Center. This course also includes a critical hands-on approach to practicing severe-thunderstorm forecasting. In-class forecasting exercises, overseen by SPC forecasters, will be an integral part of the course, requiring students to actively participate in small and large groups and present to the class, at large. Students will gain additional appreciation for communication of scientific information and discussion/interpretation of weather data.

BULLETIN: NO CELL PHONES; NO LAPTOPS; colored pencils required; otherwise, disciplinary action.

Disability support: Any student in this course who has a disability that may prevent him or her from fully demonstrating his or her abilities should contact me personally as soon as possible so we can discuss accommodations necessary to ensure full participation and facilitate your education opportunities.

Religious holidays: It is the policy of the University to excuse absences of students that result from religious observances and to provide without penalty for the rescheduling of examinations and additional required class work that may fall on religious holidays.

Academic misconduct: Zero tolerance. See university documentation on academic integrity here: `http://integrity.ou.edu`.

Late work and Make-up Policy: Assignments – homework or in-class – will NOT be accepted after their due date/time. No make-up exams will be administered. Exceptions will only be allowed for excused absences – e.g., university-sanctioned activities, appropriately documented illness, or family emergencies. If you anticipate being absent from a class for these stated reasons, it is your responsibility to inform Dr. Cohen for alternative arrangements. Participation scores will also suffer for unexcused absences.

Grades: Grades for *undergraduate* students will be calculated at the end of the semester using the following weights:

Participation	10%
Homework	15%
Quizzes	15%
Midterm Exam 1 on March 22 during normal class period	20%
Midterm Exam 2 (take-home) administered January 18 and collected April 5	20%
Final Exam on May 11 10:30 AM-12:30 PM	20%

Grades: Grades for *graduate* students will be calculated at the end of the semester using the following weights:

Participation, including mentoring undergraduate students	20%
Homework	15%
Quizzes	5%
Midterm Exam 1 on March 22 during normal class period	20%
Midterm Exam 2 (take-home) administered January 18 and collected April 5	20%
Final Exam on May 12 10:30 AM-12:30 PM	20%

Conversion to letter grades follows the table below. There will be no additional rounding of the final grade. This table takes rounding into consideration.

$< 59.5\%$	F
59.5% - 69.4%	D
69.5% - 79.4%	C
79.5% - 89.4%	B
$\geq 89.5\%$	A

Participation: Participation scores will be assigned based on the quality of contributions to class discussions / asking and answering questions, general courtesy towards instructors and speakers, involvement in class activities including occasional, irregularly scheduled weather briefings. Participation in forecast exercises will be a crucial part of the participation grade. Tardiness and unexcused absences will result in participation-grade deductions. For examples of top-quality participation contributions / weather briefings, reference descriptions of "distinguished" work provided in the following document: `http://weather.ou.edu/~scavallo/classes/metr_4491_5491/WX_BriefingRubric.pdf`.

Graduate student versus undergraduate student grading policy: The graduate students are expected to mentor the undergraduate students, so that the more experienced students are assisting the lesser experienced students. This is accomplished through multiple group work activities – in-class and homework – that require semester-long study groups to work together. This is a vital part of the participation score. As such, the expectations for graduate student participation are elevated above those for undergraduate students. In particular, the participation score for graduate students is based upon an additional 10 percentage points than undergraduate students. These 10 percentage points are evaluated based upon the instructors' assessment of how effectively graduate students facilitate an environment of small-group learning that is inclusive of undergraduate students, how well graduate students communicate challenging course materials to lesser-experienced members of the course, and how effectively graduate students are able to foster strong teamwork skills and demonstrate leadership skills in their groups.

Homework and in-class assignments: Homework and in-class assignments will be assigned irregularly and due at the time specified on the assignment. All assignments may be completed in teams, but each submitted response will be unique.

Midterm exams: Midterm Exam 1 consists of problem solving that applies theoretical principles discussed during the course to operational forecast scenarios. A combination of equation derivations, applications of these equations, and chart analysis / forecasting may be covered in Midterm Exam 1. Midterm Exam 2 is a take-home exam, and will require completion of an assortment of tasks throughout the semester.

Final exam: The final exam will consist of a forecasting challenge. Students will inherit a 06Z convective outlook and will be provided selected observational and model information used as the basis for a 13Z forecast update. They will be expected to create the 13Z forecast graphically and write a discussion that substantiates the new forecast, applying any relevant principles discussed through the class in a concise manner. Other materials/derivations may be included in the Final Exam. The Final Exam will be completed between 10:30 AM and 12:30 PM on Friday, May 12.

Development of training materials: Unique to spring semester 2017, Dr. Cohen and Mr. Thompson will be in the process of developing training materials, in collaboration with the Warning Decision Training Division. As a result, many lectures will be recorded for the purpose of creating these educational resources, which are planned to appear on the SPC website as training for those interested in meteorology (within and outside of the National Weather Service). If any student has concerns about being recorded, please contact the instructors regarding these concerns.

Semester Schedule – Subject to Change; Speaker Name in *Italics*

M 1/16: No class
W 1/18: Pre-test; syllabus review; svr tstm ingredients; skew-T log-P diagrams; lapse-rate tendency equation (Cohen)

M 1/23: Optional, food-provided recording session (Food 8:20 PM-9:00 PM; Recording 9:00 PM-11:30 PM) (Thompson)

M 1/30: QG theory/derivations (Cohen)
W 2/1: General meteorology applications (Thompson)

M 2/6: Manual analysis of upper-air charts (Weiss)
W 2/8: Manual analysis of surface charts (Weiss)

M 2/13: Group work / applications (Cohen/Thompson)
W 2/15: Forecast philosophy and decision-making (Weiss)

M 2/20: Tropical-cyclone tornadoes (Edwards)
W 2/22: Supercells and tornadogenesis (Thompson)

M 2/27: Pressure perturbations in rotating storms; related shear-buoyancy equation development (Cohen)
W 3/1: Pressure perturbations in rotating storms; related shear-buoyancy equation development; hodographs (Cohen)

M 3/6: Warn-on-Forecast and Forecasting a Continuum of Environmental Threats initiatives (Gerard)
W 3/8: Supercell and tornado parameters (Thompson)

M 3/13: Spring Break
W 3/15: Spring Break

M 3/20: Relationship between svr-tstm ingredients and storm mode; storm-scale interactions (Thompson)
W 3/22: *MIDTERM EXAM 1*

M 3/27: The Statistical Severe Convective Risk Assessment Model (Hart)
W 3/29: Group work / applications; CWA forecast (Thompson)

M 4/3: Radar / svr warning workshop (Piltz)
W 4/5: Group work / applications; outlook update (Moore)
Turn in *MIDTERM EXAM 2*

M 4/10: Tornado parameter climatology and tornado radar signatures (Thompson)
W 4/12: Baroclinic circulations and their influence in svr-tstm development; sea-breeze and terrain-enhanced svr tstms (Cohen)

M 4/17: Synoptic and mesoscale tornado patterns (Thompson)
W 4/19: NWP applications in svr-tstm forecasting (Jirak)

M 4/24: Southeast cold-season tornadoes and the PBL; northeastern CONUS svr tstms; fire-weather forecasting; monsoon convection; MCS motion (Cohen/Rogers)
W 4/26: Forecast philosophy / applications; careers; decision-making (Bunting) – WDTD;

M 5/1: Impact-Based Decision Support Services; careers (Moreland)
W 5/3: Review; group work / applications; real-time forecast (Moore/Cohen/Thompson)

F 5/12: *FINAL EXAM: 10:30 AM – 12:30 PM*